

WHAT IS CLAIMED IS:

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1. A semiconductor device with a layered structure comprising a copper film interconnect formed on one primary surface of a semiconductor substrate, and a diffusion barrier formed in contact with said copper film interconnect, wherein said diffusion barrier is <sup>Formed</sup> of a ruthenium film, and said copper film interconnect has a layered structure comprising a copper film as formed through sputtering and a copper film as formed through plating.

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2. A semiconductor device with a layered structure comprising a copper film interconnect formed on one primary surface of a semiconductor substrate, and a diffusion barrier formed in contact with said copper film interconnect, wherein said diffusion barrier is <sup>formed</sup> of a ruthenium film, and said copper film interconnect has a layered structure comprising a copper film as formed through physical vapor deposition and a copper film as formed through chemical vapor deposition.

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3. A semiconductor device with a layered structure comprising a copper film interconnect formed on one primary surface of a semiconductor substrate, and a diffusion barrier formed in contact with said copper film interconnect, wherein said diffusion barrier is <sup>formed</sup> of a ruthenium film as formed through sputtering, and said copper film interconnect has a layered structure comprising a copper film as formed through sputtering

and a copper film as formed through plating or chemical vapor deposition.

a 4. A semiconductor device with a structure comprising a copper film interconnect formed on one primary surface of a semiconductor substrate, and a plug formed in contact with said copper film interconnect, wherein said plug is <sup>Formed</sup> of at least one film selected from the group consisting of a rhodium film, a ruthenium film, an iridium film, an osmium film and a platinum film, and at least one of said copper film interconnect and said plug contains a layer as formed through physical vapor deposition.

a 5. A semiconductor device with a structure comprising a copper film interconnect formed on one primary surface of a semiconductor substrate, a diffusion barrier formed in contact with said copper film interconnect, and a plug formed in contact with said diffusion barrier, wherein said diffusion barrier is <sup>Formed</sup> of a ruthenium film, said plug is <sup>Formed</sup> of a ruthenium film, and at least one of said copper film interconnect and said plug contains a layer as formed through physical vapor deposition.

a 6. A semiconductor device with a structure comprising a copper film interconnect formed on one primary surface of a semiconductor substrate, a first diffusion barrier formed in contact with said copper film interconnect, a plug formed in contact with said first diffusion barrier, and a second diffusion barrier formed in contact with said plug and said first

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diffusion barrier, wherein said first diffusion barrier is <sup>Formed</sup> of a ruthenium film, said plug is <sup>Formed</sup> of a ruthenium film, said second diffusion barrier is <sup>Formed</sup> of a titanium nitride film, and at least one of said copper film interconnect and said first diffusion barrier is ~~of a film as~~ formed through sputtering.

7. A semiconductor device with a structure comprising a platinum electrode film formed on one primary surface of a semiconductor substrate, and a neighboring film formed in contact with said platinum electrode film, wherein said neighboring film is at least one film selected from the group consisting of a rhodium film, a ruthenium film, an iridium film and an osmium film, and at least one of said platinum electrode film and said neighboring film is ~~of a film as~~ formed through sputtering.

8. A method for producing semiconductor devices, which comprises the following steps:

a step of forming a ruthenium film on one primary surface of a semiconductor substrate through sputtering;

a step of forming a first copper film ~~to be~~ in contact with said ruthenium film, through sputtering; and

a step of forming a second copper film ~~to be~~ in contact with said first copper film, through plating or chemical vapor deposition.

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